

AMERICAN MUSEUM *Novitates*

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N.Y. 10024
Number 3151, 8 pp., 8 figures November 16, 1995

On *Brucharachne*, The Spider That Wasn't (Arachnida, Acari, Dermanyssoidea)¹

GERALD W. KRANTZ² AND NORMAN I. PLATNICK³

ABSTRACT

Examination of the holotype of *Brucharachne ecitophila* Mello-Leitão, initially described as the sole representative of the spider family Brucharachnidae, has revealed that *B. ecitophila* is not a female spider but rather a uniquely modified male mesostigmatic mite of the dermanyssine superfamily Dermanyssoidea. Based on morphological and bionomic evidence, the mite is assigned to the myrmecophilous genus *Sphaeroseius* Berlese, a Neotropical assemblage comprising three de-

scribed species. *Brucharachne* is placed as a junior synonym of *Sphaeroseius*, and *B. ecitophila* is re-described as *Sphaeroseius ecitophilus*. A generic diagnosis of *Sphaeroseius* is presented, based on published descriptions of the females of *S. praedatoris* Sellnick, *S. comes* (Moniez), and *S. ecitonis* (Wasmann), as is a short description of a nymph (deutonymph?) of *S. praedatoris*. The systematic position of *Sphaeroseius* is examined in light of newly available information on the male.

INTRODUCTION

Spiders (the arachnid order Araneae) are the quintessential example of a natural group, currently comprising 106 families containing some 3,050 genera and 36,000 species. There are at least two obvious characters that are completely universal within the order, and

completely exclusive to it (i.e., not found in any other organisms): abdominal silk glands and their associated spinnerets, and male pedipalps that are modified for sperm transfer. So obviously natural is the group that since the inception of modern nomenclature,

¹ Technical Paper No. 10,717, Oregon Agricultural Experiment Station.

² Professor Emeritus, Department of Entomology, Oregon State University, Corvallis, OR 97331.

³ Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York; Adjunct Professor, Department of Entomology, Cornell University.

with Clerck's (1757) volume on Swedish spiders, there have been few questions as to whether any Recent organism is or is not a spider. Until now, the most recent instance of any such confusion was seemingly provided by Panzer (1801), who described, as an opilionid, the common European theridiid spider now known as *Steatoda phalerata* (Panzer). Perhaps the most remarkable example of a misdiagnosis at the ordinal level, however, occurred in 1925 with the erection of a new family of spiders based on an arachnid which we have determined here to be a mite.

Mello-Leitão (1925) established the spider family Brucharachnidae to accommodate a new genus and species, *Brucharachne ecitophila*, described on the basis of a single specimen (purportedly a female) collected in Córdoba, Argentina, by Dr. Carlos Bruch. The holotype, which Mello-Leitão thought to be the most curious spider he had ever seen, was collected under a rock in the company of the army ant "*Eciton raptans*," currently *Neivamyrmex raptor* (Forel). Because of the dorsal and ventral abdominal scuta, Mello-Leitão thought the group might be related to the spider family Oonopidae, and he later (1933) listed *Brucharachne* in that family.

In reviewing genera with possible affinities to the spider family Mysmenidae, Brignoli (1980: 731) commented on the termitophilous African spider genus *Leviola* Miller, adding that:

It can be incidentally recalled that another genus, found with termites [*sic*], but much more specialized, could belong to a "Symphytognathid" family: *Brucharachne ecitophila* Mello Leitao, 1925, eyeless, completely sclerified, with long anterior legs (with clasping spines?), tarsi much longer than the metatarsi (this remarkable species, for which MELLO LEITAO instituted the family Brucharachnidae is usually listed between [*sic*] the Oonopidae).

In his subsequent catalog, Brignoli (1983: 376) formally transferred *Brucharachne* from the Oonopidae to the family Mysmenidae, commenting that the taxon was "originally described as the type genus of the family Brucharachnidae, not recognized by other authors and long merged with the Oonopidae; placed provisionally here by Brignoli, 1980: 731."

During a recent visit to the Museu Nacional, Rio de Janeiro, Brazil, the second author had the good fortune to locate Mello-Leitão's holotype of *B. ecitophila*, which had not been available to Brignoli. Examination of the specimen revealed that it is neither a mysmenid nor an oonopid, nor for that matter a spider at all. Rather, it is an extraordinary male dermanyssine mesostigmatic mite which bears a superficial but decided resemblance to a spider. Indeed, its bizarre appearance confounded our initial efforts to assign *Brucharachne* to an appropriate existing acarine genus. However, based on bionomic evidence and on certain critical morphological characters, the specimen is placed below as a member of the myrmecophilous genus *Sphaeroseius* Berlese (1904).

HISTORICAL AND MORPHOLOGICAL CONSIDERATIONS

Berlese (1904) created the genus *Sphaeroseius* to accommodate *Laelaps ecitonis* Wasmann, a large, long-legged gamasine mite found in a nest of the army ant *Labidus coecus* (Latreille) in Brazil. Only the female was recovered from the original collection. Sellnick (1925) reviewed *Sphaeroseius* and recognized two additional species in the genus, one based on a female and a nymph (possibly a deutonymph), and the other on a female alone. Both were found associated with ecitonine army ants in Brazil. The only other record of *Sphaeroseius* known to us is that of Rettenmeyer (1961), who found two specimens (presumably females) in the Reichensperger Collection which appeared to represent a species of *Sphaeroseius*. The mites had been taken with *L. coecus* in Costa Rica.

Both Berlese and Sellnick considered *Sphaeroseius* to be a genus of the dermanyssoid family Laelapidae, whereas Radford (1950) listed it in the Neoparasitidae. Neoparasitidae has since been suppressed and its member genera reassigned to the dermanyssine superfamilies Eviphidoidea, Ascoidea, Dermanyssioidea, and Rhodacaroida (sensu Johnston, 1982). Evidence garnered through study of the male and from published descriptions of the female (female specimens have not been seen) lends support to the inclusion of *Sphaeroseius* in the Laelapidae, as

originally suggested by Berlese and Sellnick. Their close association with social insects, along with the presence of a well-developed chelate-dentate digitus mobilis in the male and a separate subtriangular anal shield in both sexes, suggests that *Sphaeroseius* may best be accommodated in the subfamily Hypoaspidae sensu Radovsky (1969). At the same time, the extreme hypertrichy of the dorsal and genitiventral shields, the unusually long and robust legs, and the presence of peculiar paired dorsolateral glandlike structures in females of the three described species (Sellnick, 1925) offer grounds for speculation as to the suprageneric affinities of *Sphaeroseius*. Because critical information on the female is either lacking (e.g., leg chaetotaxy) or controvertible (e.g., setation of the sternal shield), the question of whether the genus should be given new familial or subfamilial status within the Dermapnyssioidea must remain unanswered until additional material is acquired for study.

ACKNOWLEDGMENTS

We are indebted to our colleagues Drs. Anna Timotheo da Costa and Adriano Kury for their hospitality and help at the Museu Nacional, Rio de Janeiro, Fausta Pegazzano of the Istituto Sperimentale per la Zoologia Agraria, Florence, Italy, and Richard J. Elzinga of Kansas State University, Manhattan, for notes on Berlese's specimen of *Sphaeroseius ecitonis*, and Donat Agosti of the American Museum of Natural History for help with ant species names. We thank especially Drs. Elzinga, John B. Kethley of the Field Museum of Natural History, Chicago, Evert E. Lindquist of the Biological Resources Division, Agriculture Canada, Ottawa, Lars Lundqvist of Lund University, Sweden, and Frank J. Radovsky of Oregon State University, Corvallis, for their helpful reviews of an earlier draft of this paper.

SYSTEMATICS

SPHAEROSEIUS BERLESE

Figures 1–8

Sphaeroseius Berlese, 1904: 433 (type species by original designation *Laelaps ecitonis* Wasmann, 1900).—Sellnick, 1925: 5.—Rettenmeyer, 1961: 382.

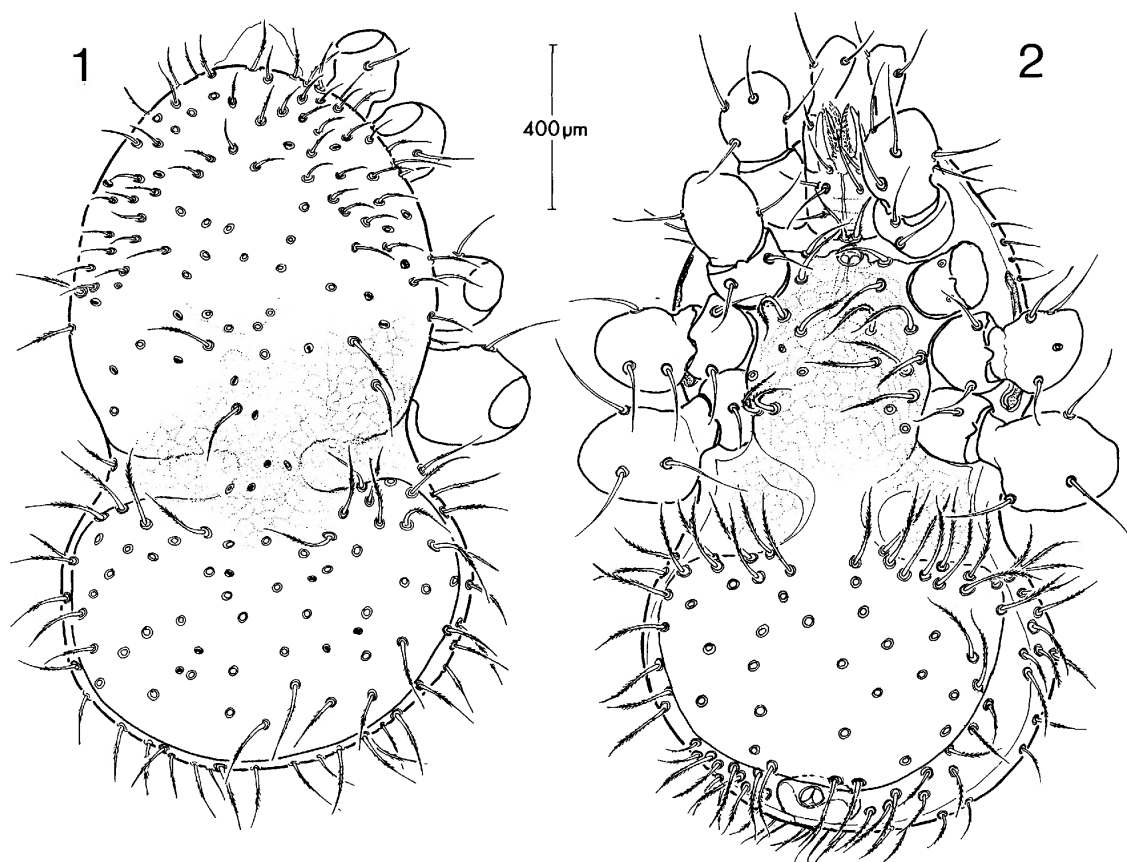
Brucharachne Mello-Leitão, 1925: 233 (type species by original designation *Brucharachne ecitophila* Mello-Leitão, 1925). NEW SYNONYMY.

The following diagnosis of *Sphaeroseius* is based on the published descriptions of the females of *S. ecitonis* (Wasmann), *S. comes* (Moniez), and *S. praedatoris* Sellnick by Berlese (1904) and Sellnick (1925), and on supplemental notes on Berlese's specimen of *S. ecitonis* provided by Drs. F. Pegazzano and R. J. Elzinga (Dr. Elzinga studied the Berlese specimen during a visit to Florence in 1963).

The description of the male of *S. ecitophilus* is based on Mello-Leitão's unique specimen of *Brucharachne ecitophila*, which we temporarily removed from its alcohol storage vial and placed in a depression slide with lactic acid for observation and illustration.

FEMALE (figs. 6–8): Length of idiosoma 1100–1560 μm , width immediately behind coxae IV 900–1150 μm . Dorsal shield entire, broadly ovate, punctate or punctate-reticulate, ornamented with number of distinctive, elliptical glandular openings (cf. crobylophores sensu Krantz and Redmond, 1987) and numerous setae, many of which may be pectinate; with paired dorsolateral glandlike structures ("Doppelfleck" of Sellnick, 1925) at level just posterior to coxae IV (fig. 8b). Sternal shield shortened, considerably broader than long, reticulate, with three or four pairs of sternal setae (metasternals may or may not be inserted on shield); genitiventral shield hypertrichous, greatly widened behind coxae IV, either rounded or slightly concave posteriorly; anal shield ventral or terminal, subtriangular, with pair of paranals inserted somewhat behind anal aperture and one shorter postanal seta; cribrum entirely posterior to anal opening. Stigmata arising laterally between insertions of coxae III–IV, peritremes extended anteriorly to level of coxae I; opisthogaster strongly hypertrichous.

Gnathosoma normally developed for superfamily, situated beneath anterior margin of dorsal shield so that most or all gnathosomatic structures are obscured in dorsal view; palpi each with three-tined apotele; epistome medially produced to broad point, margin without ornamentation. Corniculi narrow, extending anteriorly to median level of palpfemora. Chelicerae (fig. 6) with narrow



Figs. 1, 2. *Sphaeroseius ecitophilus* (Mello-Leitão), male idiosoma. 1. Dorsum. 2. Venter.

digits strongly hooked terminally; movable digit bidentate, fixed digit with single mediobasal tooth and hairlike pilus dentilis, cheliceral seta not seen.

Legs unusually long, with legs I, IV often more than twice length of body (fig. 8b); tarsi I–IV with claws and ambulacra moderately developed, leg chaetotaxy not determined.

NYMPH: The following short description of what may be the deutonymph of *S. praedatoris* is derived from the description and illustration by Sellnick (1925). It should not be considered representative of the genus as a whole.

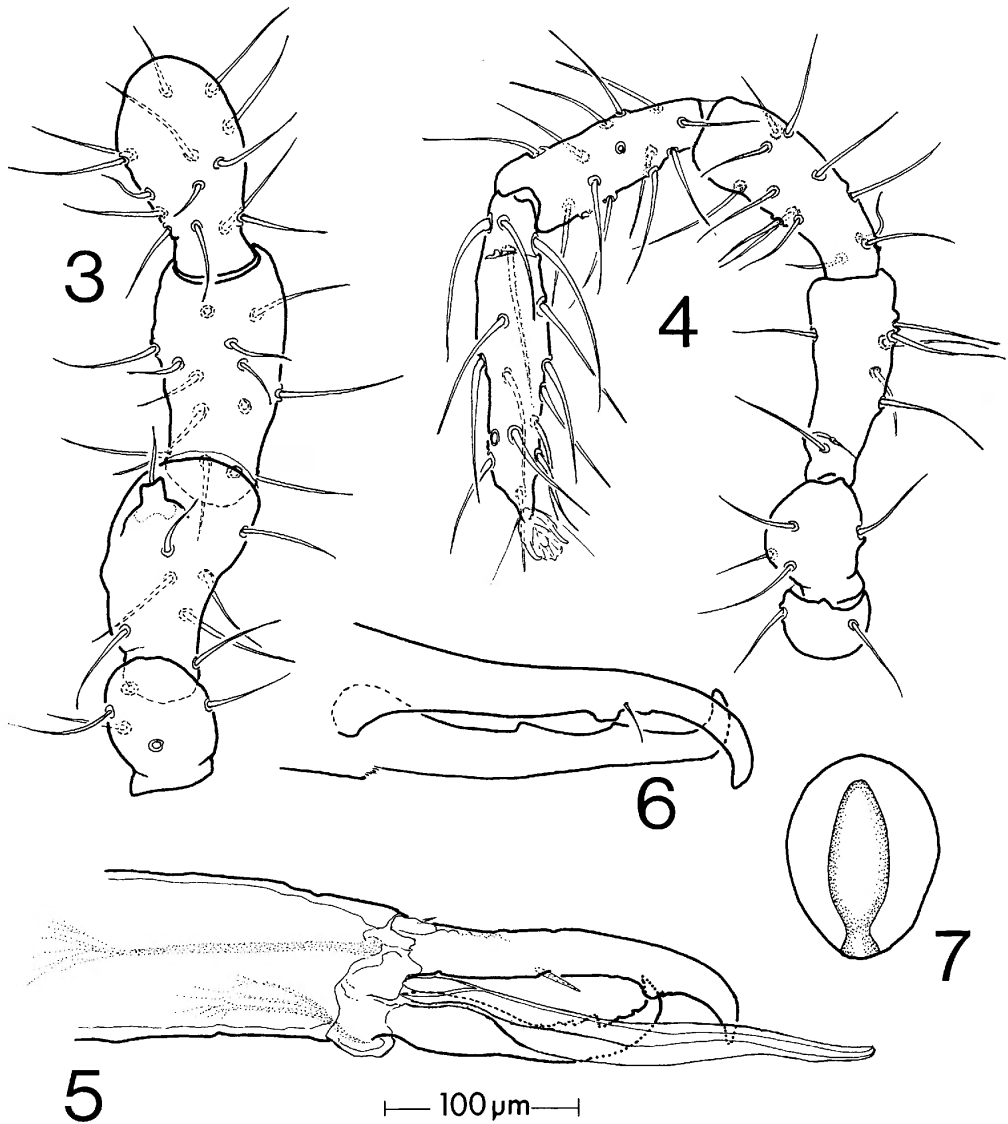
Length 990 μm , width 704 μm . Nearly white, elliptical in outline, with lateral margins almost straight. Dorsal shield not seen; dorsal setae not of equal length, completely smooth, moderately dense; some of longer posterior dorsal setae curved ventrally over shield margin. Coxae adjacent to each other,

radially arranged. Ventral shields not well developed; sternal setation not clear (either in description or illustration, Sellnick, 1925: fig. 13); anal shield present but weakly defined, with three setae; opisthogaster anterior to anal shield strongly hypertrichous. Peritremes not shown in illustration.

HABITAT: *Sphaeroseius* has been found only in association with ecitonine army ants of the genera *Neivamyrmex* and *Labidus* in Brazil, Argentina, and (possibly) Costa Rica.

Sphaeroseius ecitophilus
(Mello-Leitão),
new combination
Figures 1–5, 8a

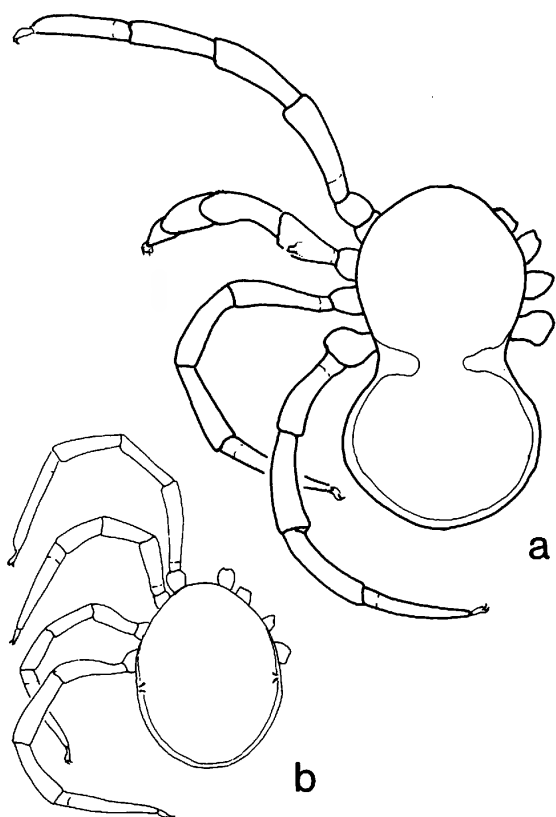
Brucharachne ecitophila Mello-Leitão, 1925: 234, figs. 2, 2a–d (putatively female [actually male] holotype from Córdoba, Argentina, in Museu Nacional, Rio de Janeiro, examined).



Figs. 3–7. 3–5. *Sphaeroseius ecitophilus* (Mello-Leitão), male. 3. Venter of leg II (trochanter-tibia). 4. Lateral aspect of leg III. 5. Chelicera in antiaxial view. 6. *S. praedatoris* Sellnick, chelicera of female (redrawn from Sellnick, 1925). 7. *Sphaeroseius*, dorsal glandular opening (derived from Sellnick, 1925).

MALE (figs. 1–5): Dorsal shield approximately 1550 μm long, strongly constricted behind coxae IV so that width varies from approximately 850 μm at level of coxae III to 725 μm at narrowest point (immediately behind coxae IV), to 900 μm at widest level of opisthosoma (figs. 1, 8a); shield with punctate-reticulate pattern throughout, ornamented with numerous glandular openings (figs. 1, 7); strongly hypertrichous, with at

least 40 podonotal and 25 opisthonotal setal pairs (not including numerous posteromarginals); most dorsal setae pectinate, with opisthonotal setae generally longer and more strongly pectinate than podonotals, many medial and opisthonotal setae missing in holotype. Dorsal shield deeply excavated behind coxae IV at point of idiosomatic constriction, with numerous pectinate setae inserted in soft integument bordering shield.



Figs. 8a, b. Dorsal habitus of *Sphaeroseius* (male and female not drawn to same scale). 8a. *S. ecitophilus* (Mello-Leitão), male. 8b. *Sphaeroseius* sp., female (*S. ecitonis* Wasmann?, redrawn from Berlese, 1904).

Venter (fig. 2) with sternal, genital, and ventral shield elements fused into sternoventral shield, anal shield free. Podogastric portion of sternoventral shield strongly punctate-reticulate, with anteromarginal genital aperture and 8–9 pairs of long, spinose setae (mostly pectinate distally), lyrifissures not observed; shield with pair of large, rounded foveae immediately behind podogaster, flanking flat median ridge between podogaster and opisthogaster; foveae retain sclerotization and punctate-reticulate pattern but lack setae; tritosternum inserted just anterior to genital aperture, with pair of long, strongly pilose laciniae. Opisthogaster covered by broad, posteriorly rounded, hypertrichous ventral shield element bordering postpodogastric foveae at its anterolateral margins; anterior opisthogastric setae strongly devel-

oped, distally pectinate, most of more posterior setae missing on holotype. Anal shield terminal in position, distorted and folded in slide preparation (depiction of anal shield in fig. 2 is an approximation), shield setation not determined. Stigmata originating laterally between coxae III–IV; peritremes short, extending anteriorly only to level of coxae II. Numerous pectinate marginal setae inserted in soft integument surrounding opisthogastric and anal shields.

Gnathosoma (fig. 2) ventrally inserted so that only epistome and palpal extremities are easily observed in dorsal view. Hypostomatic and capitular setae smooth; deutosternal groove narrow, denticles extending laterally from groove in indeterminate series of rows across gnathosomatic venter; corniculi narrow, saberlike, extending anteriorly to palp-femoral bases, palpal apotele with three tines. Chelicerae (fig. 5) similar to those of female (fig. 6), with narrow digits strongly hooked terminally; fixed digit longer than movable digit, with subterminal tooth and large medially inserted pilus dentilis, cheliceral seta hairlike, inconspicuous; movable digit with large subterminal tooth and series of adjacent smaller teeth, with long, narrow, terminally free spermatodactyl arising paraxially from inner basal angle of digit, extending antiaxially well beyond its terminus. Epistome (fig. 1) medially produced into broad, rounded, unornamented flap.

Legs long, robust, length far exceeding that of idiosoma (fig. 8a); claws and ambulacra moderately developed, trochanters IV enlarged and bulbous, femur II with setigerous spur on distiventral aspect (fig. 3). Leg chaetotaxy (figs. 3, 4) singular in terms of other free-living dermanyssines (Evans, 1963; e.g., tibia I with 16 setae, tibiae II–III and genua II–III each with 14 setae); only four (of the typical five) trochanteral setae observed on leg III.

FEMALE AND IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: Only the holotype male, taken beneath a rock in the presence of *Neivamyrmex raptor* in Córdoba, Argentina, on January 10, 1924, by C. Bruch. The holotype (in alcohol) and an excised chelicera mounted in Hoyer's medium are in the Museu Nacional, Rio de Janeiro.

DISCUSSION

The recognition of *S. ecitophilus* as a male mite rather than a female spider not only rectifies a long-standing taxonomic error in the spider literature, but provides important new information on a dermanyssine genus which has been collected only rarely since its discovery over a century ago. The identification of Mello-Leitão's species as a member of the genus *Sphaeroseius* has been established here both on the basis of unique morphological characters which it shares with described females of the genus, and on having been collected in a habitat to which *Sphaeroseius* appears to be specific—an ecitonine army ant nest. Important morphological similarities are the inordinately long legs, the dorsal and ventral accessory setae on the idiosoma, the presence of numerous elliptical glandular openings on the dorsal shield, a free anal shield, long, narrow cheliceral digits, and 3-tined palpal apoteles. In addition, the male and female each possess an unusual dorso-lateral modification of the idiosoma just behind coxae IV (figs. 8a, b). Females have distinctive, paired, postcoxal glandular openings which could conceivably be involved in the production of an allomone for protecting the mites from predation in the army ant milieu. The postcoxal region in the male type specimen of *S. ecitophilus* is occupied by a pedicellate constriction which is strong enough to have led Mello-Leitão (1925) to a misdiagnosis at the ordinal level. We were unable to locate definitive dorsolateral gland openings in the constricted postcoxal regions of the male, but suspect that the dorsolateral depressions may mark the sites of paired glands similar to those of the female. The opposing ventral postcoxal foveae lie just behind the bulbous trochanters IV (fig. 2) and could accommodate the trochanters during locomotion. One can only speculate as to why development in the male of *S. ecitophilus* differs so radically from that in known females of *Sphaeroseius*. Clearly the need in females for a configuration that allows room for maturation of progeny would not favor development of the radical modification seen in the male.

Sellnick (1925) reported that *S. ecitonis* and *S. comes* were found on their army ant as-

sociates and described *S. praedatoris* as having been collected on the army ant, *Labidus praedator* (F. Smith). However, Rettenmeyer (1961) pointed out that both *S. ecitonis* and *S. comes* were described from ant columns rather than from the ants themselves (Moniez, 1895; Wasmann, 1900). In fact, their extremely long legs and general habitus (figs. 8a, b) strongly suggest that *Sphaeroseius* species are adapted for traveling with the army ant colony on raiding sortees. Their rarity in collections may be tied to a cryptic lifestyle in the nests of their hosts, or to the difficulty of locating and collecting them in a moving swarm or column. While only a single specimen of *S. ecitophilus* was collected from the presumed subterranean bivouac of its ant host, it may be that collections from raiding columns of *Neivamyrmex raptor* would yield many more examples, both male and female. The fact that two of the three host ants of the four described species of *Sphaeroseius* are known to nest in subterranean cavities (*Labidus coecus* may also be subterranean) suggests that *Sphaeroseius* may occur only with army ants which are below-ground nesters.

We have chosen to retain Mello-Leitão's specific designation for *S. ecitophilus* because it is not possible to assign the holotype to an existing species of *Sphaeroseius* on the basis of the published descriptions of the females. In this connection, it should be noted that Berlese (1904) alluded to the possibility that *S. comes* was synonymous with *S. ecitonis*. He redescribed and illustrated *S. ecitonis* from a single female provided by Wasmann, noting that the idiosomatic setae were simple and moderately dense ("... in dorso pilis sat densis ornatus. Venter pilis aliquot simplicibus ornatus"). Berlese's illustration of the dorsum shows approximately 30 pairs of simple, symmetrically inserted setae. Sellnick (1925) redescribed *S. ecitonis* on the basis of another female specimen from Wasmann's collection, but his description differs significantly from that of Berlese. Among other discrepancies, Sellnick found the dorsal setae to be more numerous than shown by Berlese, and observed that many of them were pectinate ("Berlese zeichnet in seiner Figur ... nichts von diesen Borsten. Auch muss ich nach meinen Beobachtungen sagen, das von einer so regelmässigen Stellung der Borsten

auf dem Rücken, wie sie in Berleses Figur dargestellt ist, gar keine Rede sein kann. Die Borsten sind auch weit zahlreicher als die Zeichnung sie zeigt"). Recent examination of Berlese's specimen of *S. ecitonis* by Dr. F. Pegazzano verified that the description and illustrations of idiosomatic setae by Berlese are accurate, which suggests that either Berlese or Sellnick was looking at a species other than *S. ecitonis*. Wasmann's original description offers little help in resolving this matter. Only one of the other two previously described species of *Sphaeroseius* was described as having all idiosomatic setae simple (*S. comes*). It was perhaps for this reason that Berlese suggested the synonymy between *S. ecitonis* and *S. comes*.

Based on their singular morphology and habitat, the four known species of *Sphaeroseius* appear to comprise a unique myrmecophilous assemblage which may be accom-

modated in the cohort Dermanyssina, superfamily Dermanyssoidea. As noted above, resolution of the systematic position of *Sphaeroseius* within the superfamily may be possible only when more adults and immatures become available for study. For the present, we choose to consider *Sphaeroseius* a member of the dermanysoid family Laelapidae, subfamily Hypoaspidae sensu Radovsky (1969).

In closing, it should be mentioned that the family-group name Brucharachnidae has priority over Hypoaspidae, but has not been used (except in catalogs) during the past 50 years. Because the name Hypoaspidae has been used by more than five authors in over 10 publications since 1945, "a prima facie case that stability is threatened" can be made under Article 79b of the International Code of Zoological Nomenclature, and we therefore retain the name Hypoaspidae.

REFERENCES

- Berlese, A.
1904. Illustrazione iconografia degli Acari mirmecofili. *Redia* 1: 299-474.
- Brignoli, P. M.
1980. On few Mysmenidae from the Oriental and Australian regions (Araneae). *Rev. Suisse Zool.* 87: 727-738.
1983. A catalogue of the Araneae described between 1940 and 1981. Manchester: Manchester Univ. Press, 777 pp.
- Clerck, C.
1757. *Aranei Suecici, descriptionibus et figuris oeneis illustrati, ad genera subalterna redacti speciebus ultra LX determinati.* Stockholm, 154 pp.
- Evans, G. O.
1963. Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). *Bull. Br. Mus. Nat. Hist. Zool.* 10: 277-303.
- Johnston, D. E.
1982. Acari Parasitiformes. In S. B. Parker (ed.), *Synopsis and classification of living organisms*, 2: 111-117. New York: McGraw-Hill.
- Krantz, G. W., and B. L. Redmond
1987. Identification of glandular and poroidal idionotal systems in *Macrocheles pergander* F. & P. (Acari: Macrochelidae). *Exp. Appl. Acarol.* 3: 243-253.
- Mello-Leitão, C. F. de
1925. Dois interessantes arachnideos myrmecophilos. *Physis* 8: 228-237.
1933. *Catalogo das aranhas argentinas.* Arch. Esc. Sup. Agr. Med. Veter. 10: 3-63.
- Moniez, R.
1895. Sur quelques arthropodes trouves dans des fourmilières. *Rev. Biol. Nord France* 6: 201-215.
- Panzer, G. W. F.
1801. *Faunae Insectorum Germaniae Initia.* Deutschlands Insekten. Hefte 21. Regensburg.
- Radford, C. D.
1950. Systematic check list of mite genera and type species. *Internat. Union Biol. Sci., Paris, Sér. C*, 1: 232 pp.
- Radovsky, F. J.
1969. Adaptive radiation in the parasitic Mesostigmata. *Acarologia* 11: 450-483.
- Rettenmeyer, C. W.
1961. Arthropods associated with Neotropical army ants with a review of the behavior of these ants (Arthropoda: Formicidae: Dorylinae). Ph.D. thesis, Univ. Kansas, Lawrence: xv + 605 pp. (UMI Catalog No. 630-0829).
- Sellnick, M.
1925. Die Gattung *Sphaeroseius* Berl. (Acar. Laelapt.). *Entomol. Mitt.* 14: 5-11.
- Wasmann, E.
1900. Neue Dorylinengäste aus dem neotropischen und dem äthiopischen Faunengebiet. 114. Beitrag zur Kenntnis der Myrmekophilen und Termitophilen. *Zool. Jahrb. Syst.* 14: 215-290.